AIR CONTENT OF FRESHLY MIXED CONCRETE BY THE VOLUMETRIC METHOD ASTM C 173

APPARATUS

- [ ] Air Meter has annual calibration
- [ ] Funnel
  - [ ] Spout of a size permitting insertion through neck of top section
  - [ ] Spout long enough to extend to a point just above bottom of top section
  - [ ] Discharge end of spout so constructed that when water added to container there is minimum disturbance of concrete
- [ ] Tamping Rod
  - [ ] Round, straight 5/8 ± 1/8 in. diameter rod
  - [ ] Not less than 12 in. in length
  - [ ] Both ends rounded to hemispherical tip with diameter of 5/8 in.
  - [ ] Steel, high density polyethylene, or other plastic of equal or greater abrasion resistance
- [ ] Strike-Off Bar
  - [ ] Flat, straight bar of steel at least 1/8 in. thick by 3/4 in. wide by 12 in. long
  - [ ] Flat, straight bar of high density polyethylene or other plastic of equal or greater abrasion resistance at least 1/4 in. thick by 3/4 in. wide by 12 in. long
- [ ] Calibrated Cup, within 1.00 ± 0.04 percent of volume of bowl (Only used when concrete air content exceeds 9 % or the calibrated range of meter)
- [ ] Syringe, rubber bulb with a capacity at least 2 oz
- [ ] Pouring Vessel, with capacity of approximately 1 qt
- [ ] Scoop, metal, large enough to obtain representative sample and small enough to prevent spilling when concrete is added to bowl
- [ ] Isopropyl alcohol, 70 percent by volume (Note 1). Other foam-dispersing agents may be used if tests show that their use will result in an error in indicated air content of less than 0.1 % or if correction factors are developed. When other dispersing agents are used, a copy of the records documenting the testing or calculations shall be available.

  Note 1 -- Seventy percent isopropyl alcohol is commonly available as rubbing alcohol. More concentrated grades can be diluted with water to the required concentration.
- [ ] Measuring vessel for isopropyl alcohol, minimum capacity of 1 pt with graduations of no more than 4 oz
- [ ] Mallet
  - [ ] Rubber or rawhide head
  - [ ] Weight of 1.25 ± 0.5 lb

PROCEDURE

Rodding and Tamping

[ ] Bowl wetted and dried to damp not shiny appearance
[ ] First layer added with scoop to approximately 1/2 depth of bowl. Scoop moved around perimeter of the bowl opening while concrete is placed in bowl
  [ ] Layer rodded 25 times with tamping rod
  [ ] Bottom of bowl not struck when rodding
  [ ] Bowl tapped 10 to 15 times with mallet after rodding
[ ] Second layer added to bowl
  [ ] Layer rodded 25 times with tamping rod
  [ ] Rod penetrates the first layer approximately 1 in.
  [ ] Bowl tapped 10 to 15 times with mallet after rodding
  [ ] After tapping, a slight excess of concrete, 1/8 in. or less, is acceptable. Representative concrete may be added or removed to obtain the required amount of concrete.

Striking Off

[ ] Top surface struck off with bar until surface is flush with top of bowl
[ ] Flange of bowl wiped clean

Adding Water

[ ] Inside of the top section of meter, including gasket, is wetted
[ ] Top section attached, funnel inserted, and at least 1 pt of water added
[ ] 2.0 pt of isopropyl alcohol added and recorded (Note 2)

Note 2 -- The amount of isopropyl alcohol necessary to obtain a stable reading and a minimum of foam at the top of the water column will depend upon a number of factors. Some high-cement mixes made with silica fume that have air contents of 6 % or more may require more than 3 pt of alcohol. The amount varies with concrete air content, amount and type of air-entraining admixture, cement content, or cement alkali content, and perhaps other factors. Generally, the amount of alcohol necessary can be established for given mixture proportions and should not change greatly during the course of a job.

[ ] Water added until it appears in graduated neck of top section (Note 3)

Note 3 -- When necessary to use more than 4 or 4.5 pt of isopropyl alcohol, it may be necessary to restrict the amount of water added initially to avoid overfilling the meter. However, some water is required to aid in mixing the alcohol and limiting the contact of the concentrated alcohol with the top surface of the concrete.

[ ] Funnel removed and water added with rubber syringe until the bottom of the miniscus is level with zero mark
[ ] Cap attached and tightened

Freeing Concrete from Base

[ ] Meter quickly inverted, base shook horizontally, and meter returned to upright position. (meter not inverted for more than 5 seconds at a time)
[ ] Meter inverted and agitated for a minimum of 45 seconds and until concrete has broken free and aggregate is heard moving in the meter as the meter is inverted

Rolling

[ ] Meter tilted approximately 45 degrees from the vertical position with the bottom edge of the base of the meter resting on the work surface
[ ] Meter vigorously rolled 1/4 to 1/2 turn forward and back several times, quickly starting and stopping the roll
[ ] Base of meter turned about 1/3 turn and rolling procedure repeated
[ ] Turning and rolling procedure continued for approximately 1 minute. (Aggregate is required to be heard sliding in the meter during this process. Any leaking of liquid during inversion and rolling process is cause to consider test invalid)
[ ] Meter set upright and top loosened to allow any pressure to stabilize
[ ] Meter allowed to stand until liquid level stabilizes by not changing more than 0.25 percent within 2 minute period. (If the stabilization of the liquid takes more than 6 minutes or if there is more foam than that equivalent to 2 full percent air content divisions on the meter scale, the test is considered invalid)
[ ] Bottom of the meniscus read and recorded as initial meter reading to the nearest 0.25 %, if the level is stable without excessive foam. (If air content is greater than the 9 % range of the meter, a sufficient number of calibrated cups of water are added to bring the liquid level within the graduate range. The number of calibrated cups is recorded)

Confirmation of Initial Meter Reading

[ ] One minute rolling and rocking procedure repeated and a new reading obtained
    [ ] If reading has not changed more than 0.25 % from initial reading, the reading is recorded as the final meter reading
    [ ] If reading has changed by more than 0.25 %, the reading is recorded as the "newest initial reading" and the one-minute rolling and rocking procedure is repeated. If the additional reading has not changed by more than 0.25 % from the newest initial reading, the reading is recorded as the final meter reading. (Sample is discarded if retest exceeds 0.25 % and a new sample is obtained. Test is repeated with an increase of 0.5 % of isopropyl alcohol)
[ ] Meter disassembled and contents examined to assure there are no portions of undisturbed, tightly packed concrete in base

[ ] If less than 2.5 pt of isopropyl alcohol is used, the final meter reading is the air content of the sample

[ ] If 2.5 pt or more of isopropyl alcohol is used, the correction from Table 1 is subtracted from the final meter reading to obtain the air content of the sample

70 % Isopropyl Alcohol Used			Correction (Subtract)
pt	oz	L	
0.5	8	0.2	0.00
1.0	16	0.5	0.00
1.5	24	0.7	0.00
2.0	32	0.9	0.00
2.5	40	1.2	0.15
3.0	48	1.4	0.30
3.5	56	1.7	0.45
4.0	64	1.9	0.60
4.5	72	2.1	0.75
5.0	80	2.4	0.90

Table 1

[ ] If water added to meter in one calibrated cup increments, the air content is calculated by adding the number of water cups to meter reading

[ ] Air content reported to the neatest 0.25 %

NA - Not Applicable
X - Requires Corrective Action
√ - Satisfactory

_____
Acceptance Technician

_____ _____
INDOT Date

Comments: _____

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